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(54) **METHOD AND SYSTEM FOR A TOWED VESSEL SUITABLE FOR TRANSPORTING LIQUIDS**

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(60) Provisional application No. 61/303,519, filed on Feb. 11, 2010.

(51) **Int. Cl.**
B63B 22/02 (2006.01)

(52) **U.S. Cl.**
USPC **441/4**

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See application file for complete search history.

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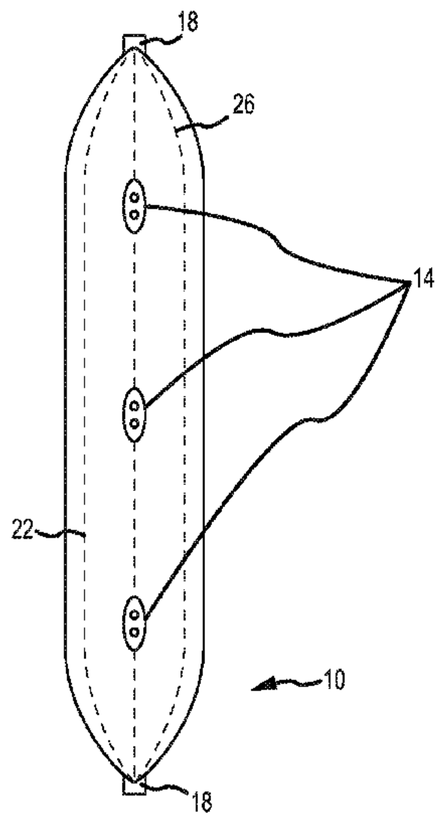
(57) **ABSTRACT**

A portable towed vessel suitable for containing and transporting various liquids is disclosed. The vessel further comprises various features useful in navigation and storage of the device, both when in use for transporting fluids and when transported in an emptied state. Such features include navigational and positioning devices and methods, and means for emptying and deflating a towed vessel. Aspects of the present invention further include the ability to quickly fill and evacuate a towed vessel and features useful for purifying or preserving the purity of fluid to be transported.

20 Claims, 8 Drawing Sheets



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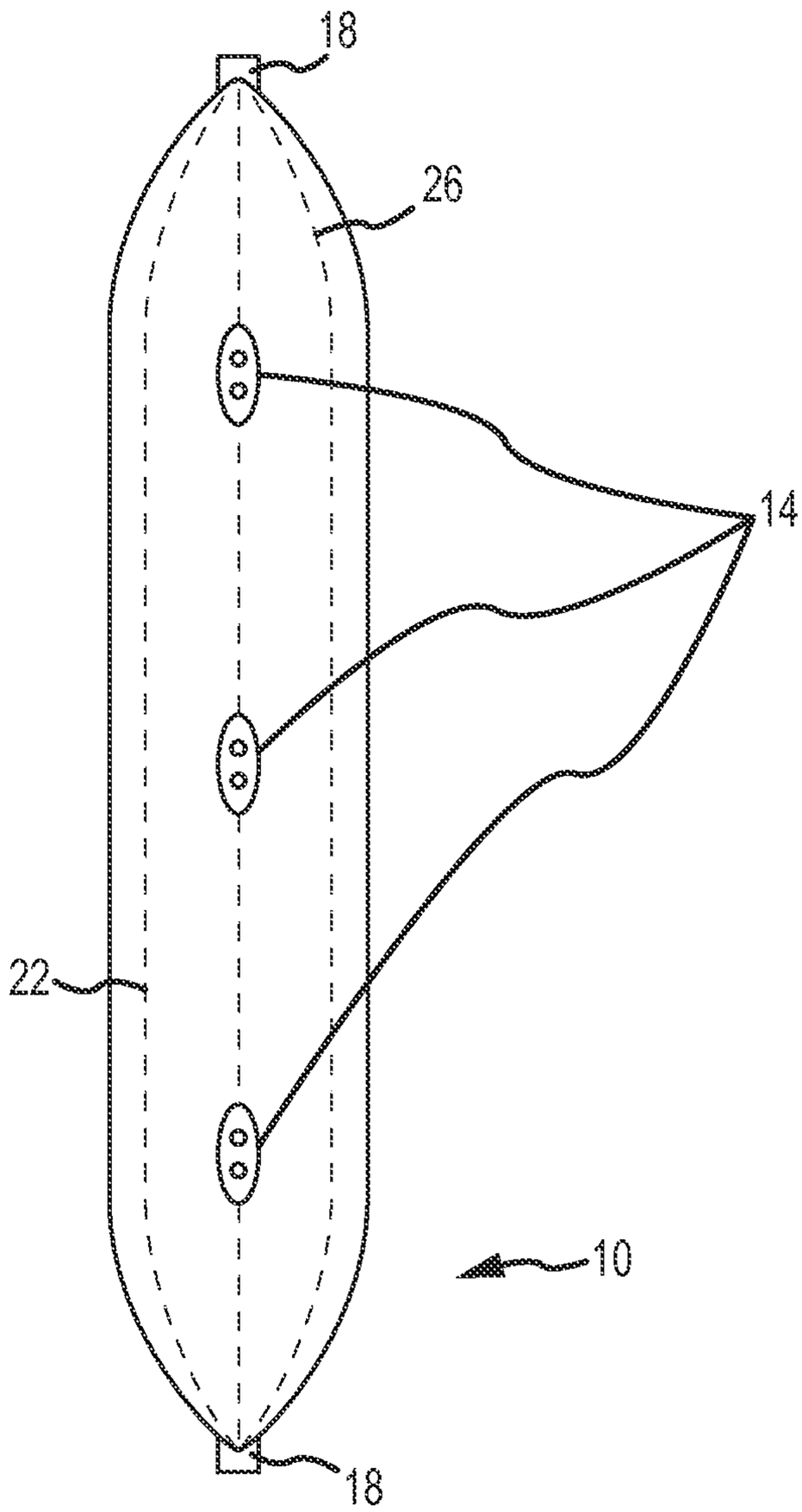

FIG. 1

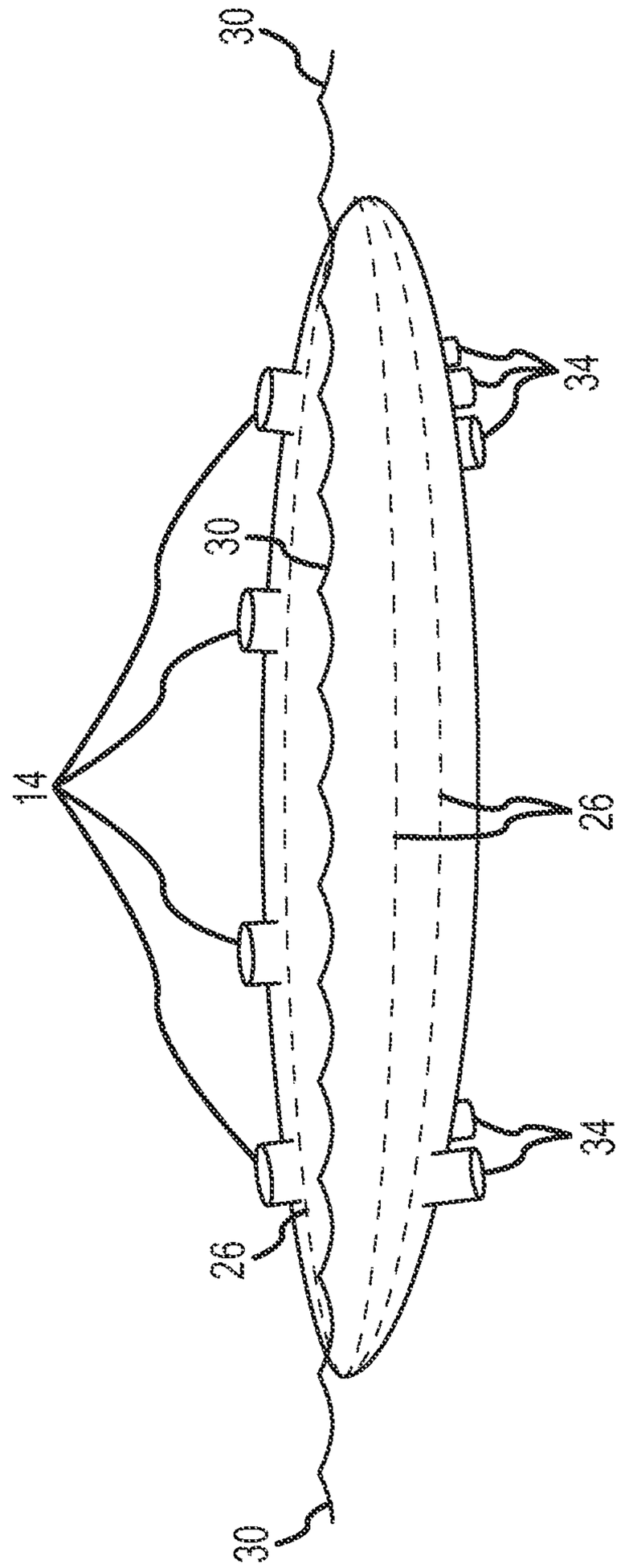

FIG. 2

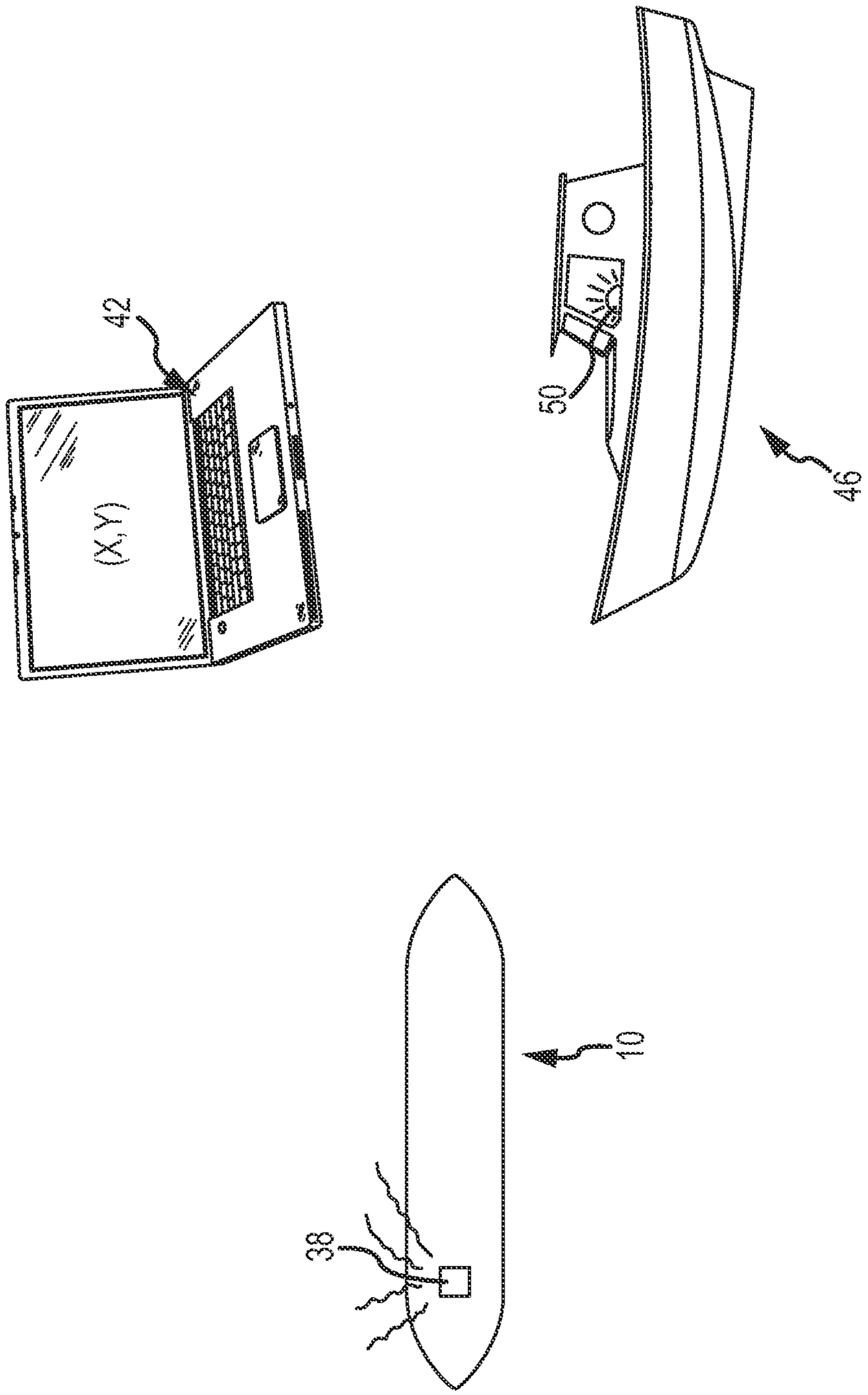

FIG.3

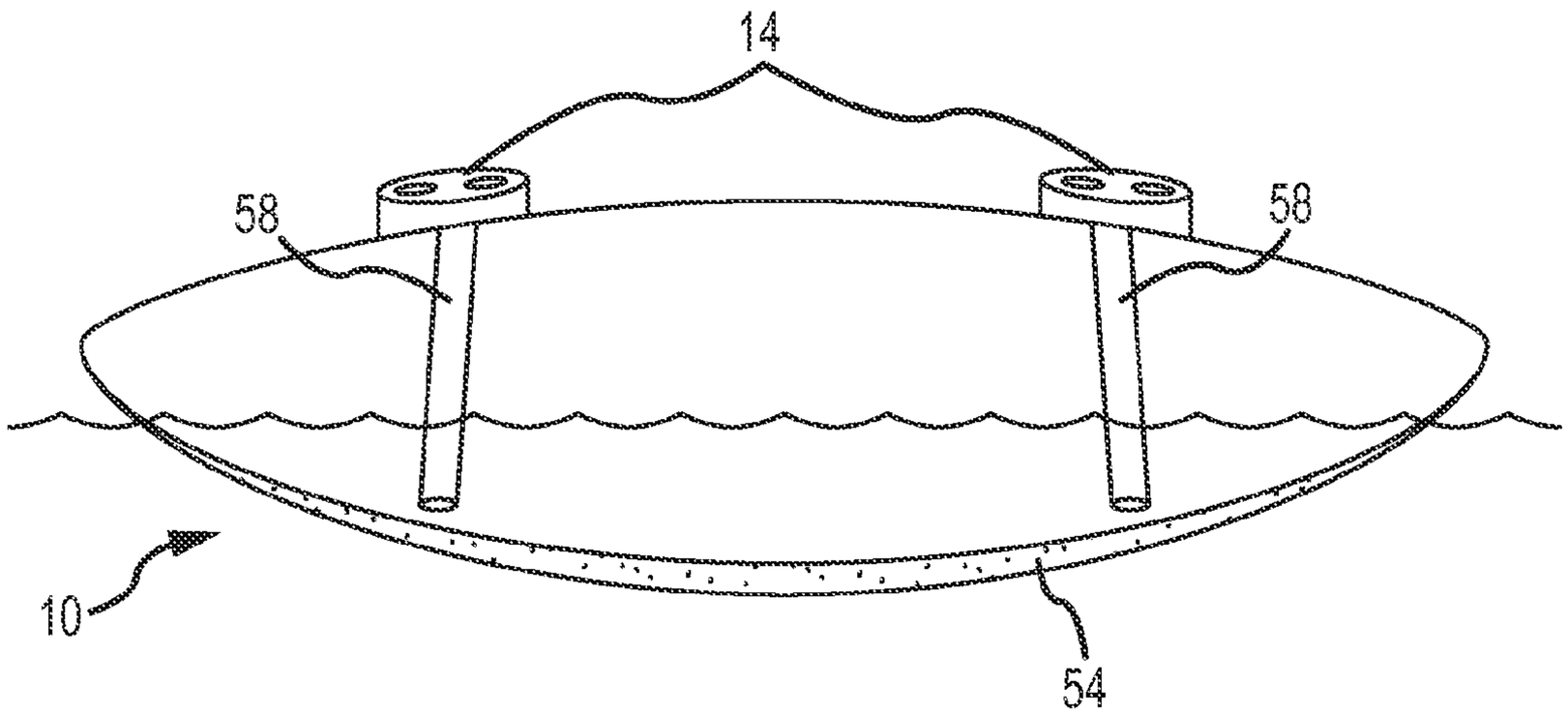

FIG.4

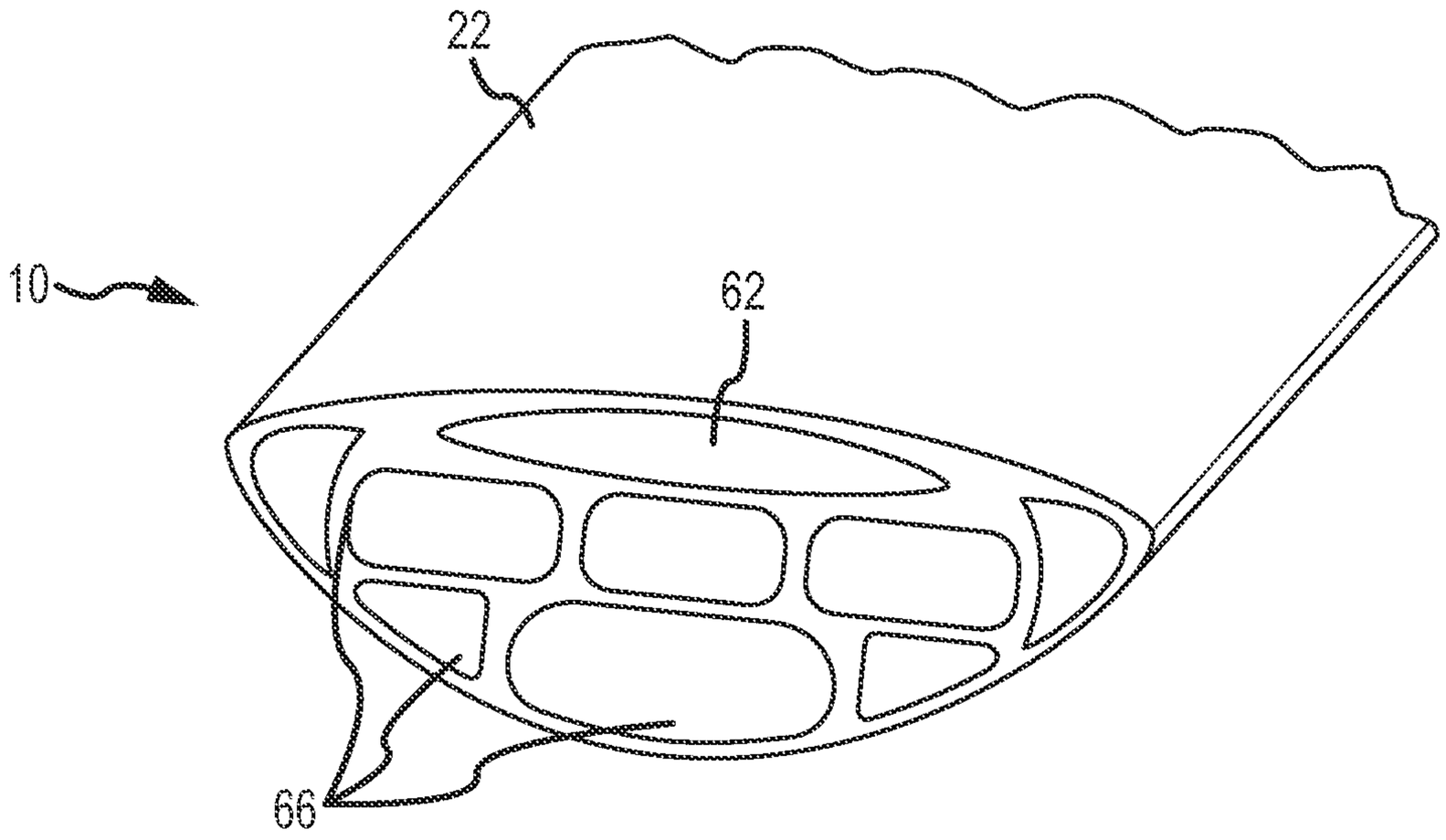

FIG.5

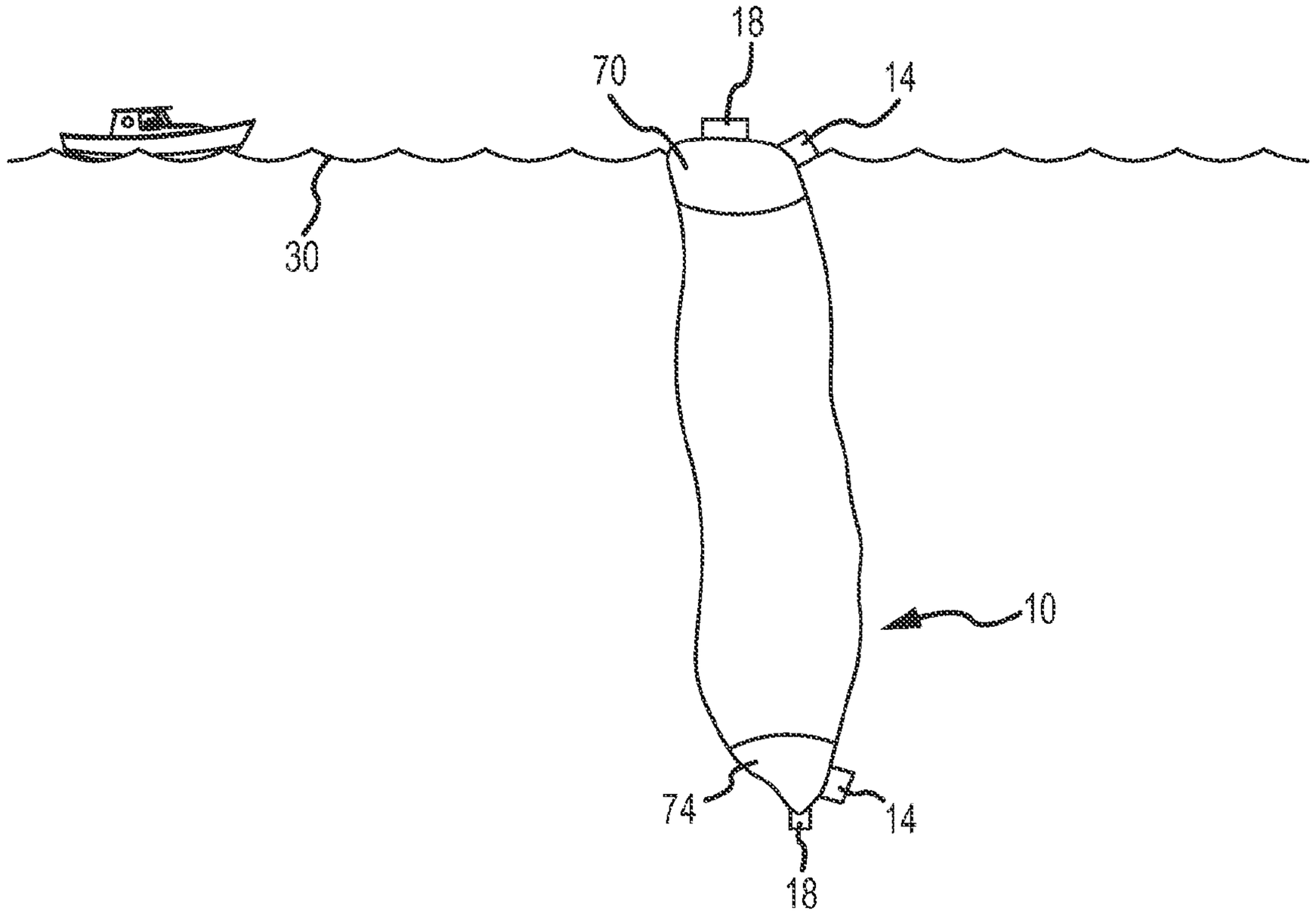

FIG.6

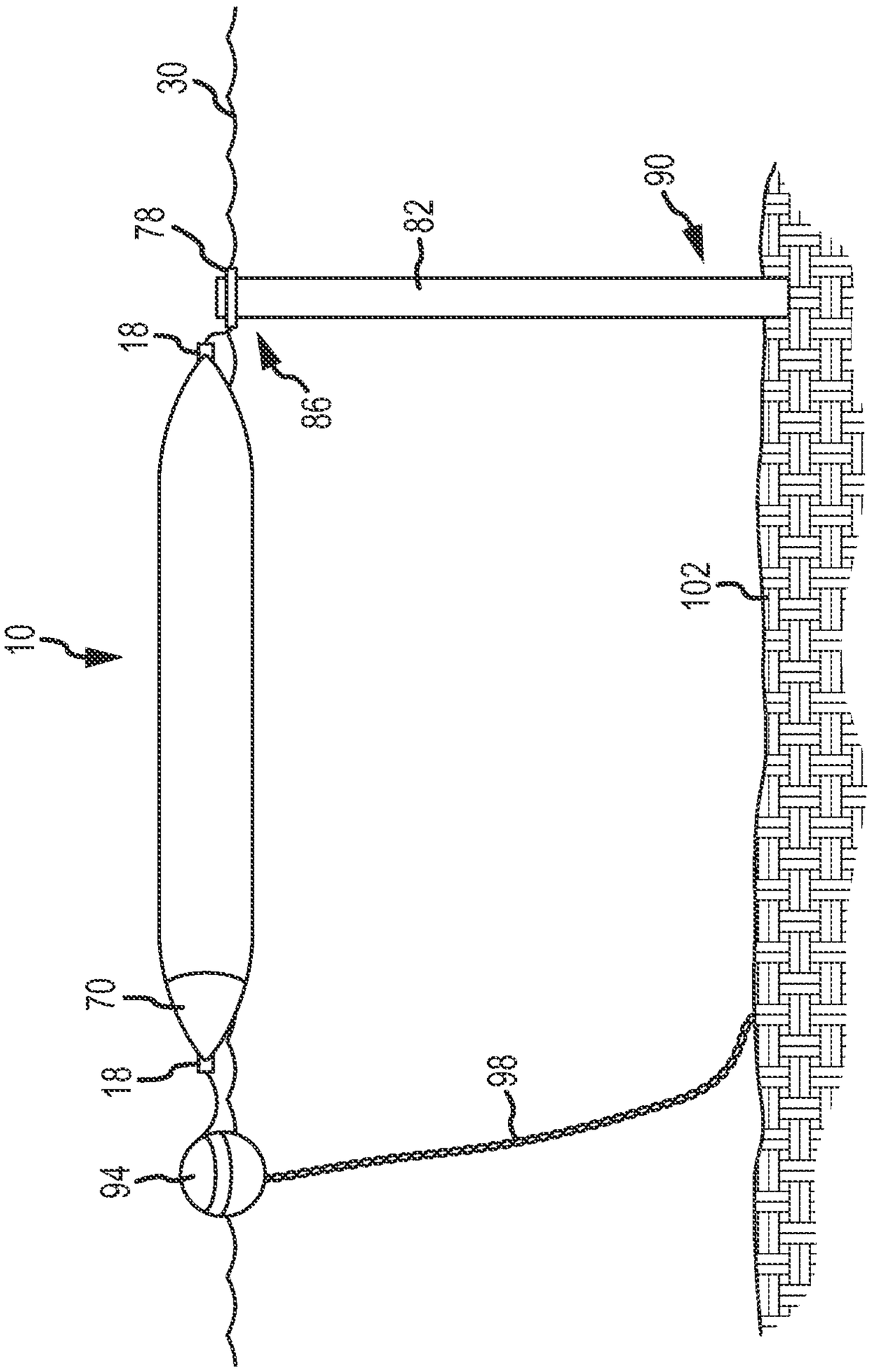

FIG. 7

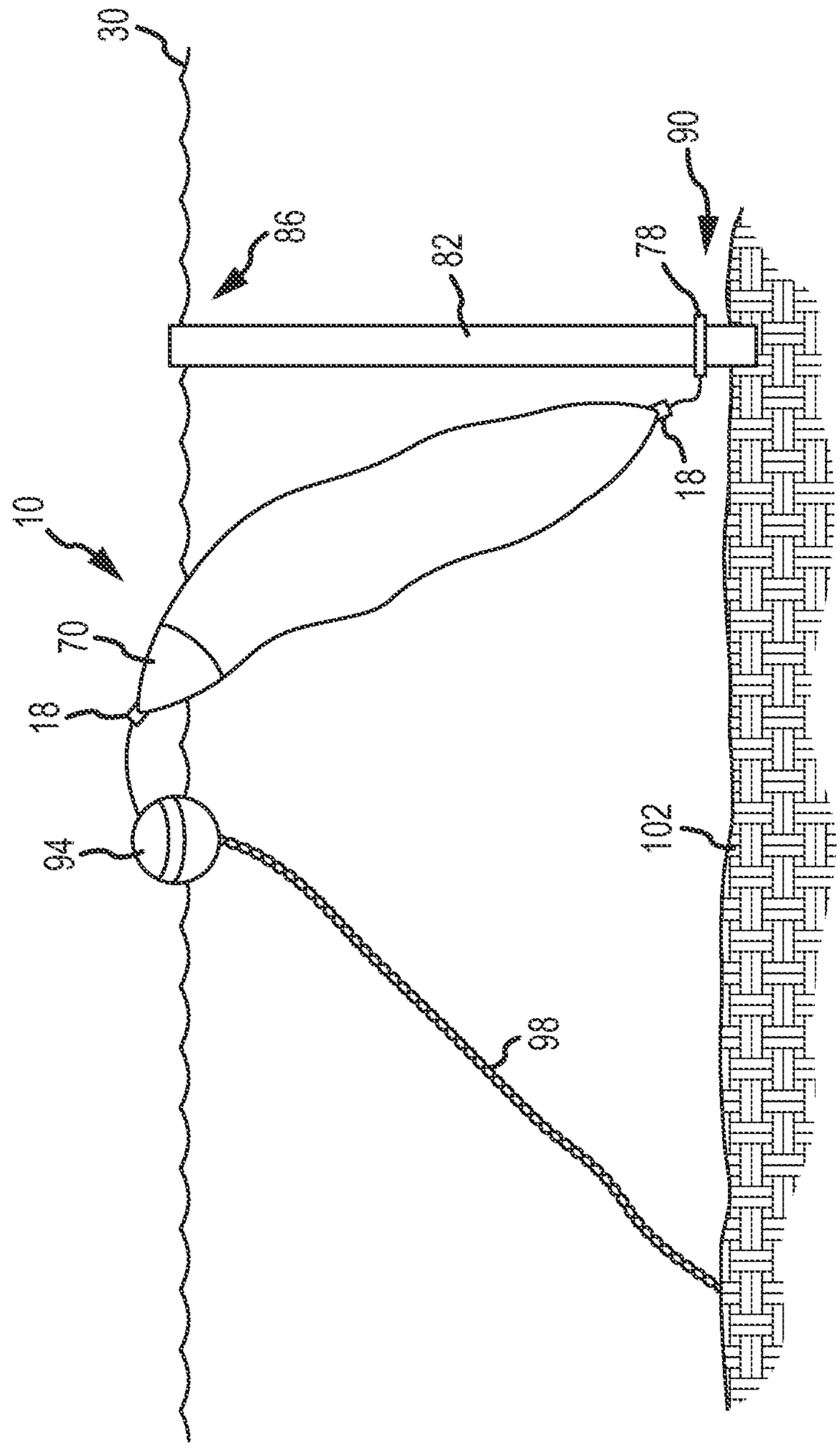

FIG. 8

METHOD AND SYSTEM FOR A TOWED VESSEL SUITABLE FOR TRANSPORTING LIQUIDS

This Application is a Continuation Application of and claims the benefit of priority from U.S. patent application Ser. No. 13/025,796 filed on Feb. 11, 2011, which claims priority from U.S. Provisional Patent Application Ser. No. 61/303,519, filed on Feb. 11, 2010, entitled "Method and System for a Towed Vessel Suitable for Transporting Liquids," the entire discloses of which are hereby expressly incorporated by reference in their entireties.

FIELD OF THE INVENTION

The present invention relates generally to a method and system for transporting fluent cargo through a liquid. More specifically, the invention relates to a towable container capable of housing a large volume of water/beverage and capable of being towed or otherwise conveyed through a larger body of water.

BACKGROUND OF THE INVENTION

As the world's population continues to increase, so does the demand for fresh water that is safe for consumption and the like. Despite many advances in water purification technology, many areas of the world are currently affected and will continue to be affected by a lack of this fundamental natural resource. Currently, many methods, such as reverse-osmosis, exist for the purification and desalination of water in order to produce potable and commercially appealing drinking products. Many of these processes suffer from the drawbacks of high production costs, resulting carbon emissions from the facilities in which they take place, and a significant level of waste water per volume of resulting potable water. As the demand for clean water increases, some methods have also been criticized for the strain they put on natural aquifers. In coastal regions with groundwater aquifers underlain by saline layers, concerns of saltwater encroachment exist where the over-burdening of freshwater aquifers creates a pressure differential that allows heavy concentrations of salt water to infiltrate the drinking supply.

Indeed, many areas in need of a reliable water supply do not have the availability of the resource itself to even reap the benefits of purification technologies. At the same time, however, a few specific regions of the Earth have abundant supplies of fresh, clean, and safe water which offer the potential to alleviate demands for water by utilizing the appropriate means for conveyance.

Devices and methods for transporting large volumes of water to distant regions of the Earth have proved costly and inefficient. For example, filtration, purification, and bottling of water for transportation and consumption have become a subject of scrutiny in recent years. In addition to the raw energy consumption required to produce clean water, it is estimated that at least twice the amount water is used in the production process than is actually bottled. In other words, one liter of bottled water may represent as much as three liters of water consumed. It has also been estimated that tens of millions of barrels of oil were required to generate the energy needed to produce the volume of bottled water consumed in the United States in 2007. Furthermore, the production and transportation costs of these methods are proving to be more and more taxing upon our planet's already strained natural resources.

Recent research has also revealed that one common method for transporting water and drinking liquids, containment via plastic bottles, poses a variety of health and environmental risks. It is estimated that approximately 70 million plastic bottles of water are consumed daily in the United States alone. In addition to the obvious strain that this puts on landfills and natural resources, many of these bottles may also contain Bisphenol ("BPA") which may pose health risks to humans. Even bottles that do not contain BPA pose the risk of leaching other chemicals into the contained water or fluid. While bottled water is not without its benefits, it is often desirable to reduce the amount of bottles used or the duration which water or liquid is stored in the bottles.

Accordingly, a long felt but unsolved need exists for a method and system that can be economically employed to contain and convey pure and safe drinking water from various regions of the Earth to those having a need or demand for the same.

SUMMARY OF THE INVENTION

Applicant hereby incorporates by reference in their entireties U.S. patent application Ser. No. 11/551,125 to Szydlowski, filed on Oct. 19, 2006 and U.S. Provisional Patent Application 61251912 to Szydlowski, filed on Oct. 15, 2009.

Devices for transporting a single large volume of water or liquid in and through the Earth's waterways have been contemplated. For example, U.S. Pat. No. 6,550,410 to Reimers, which is hereby incorporated by reference in its entirety, discloses a system and method for storing and conveying fluids, where the system is adapted for towing by marine crafts in offshore conditions. Reimers further discloses a collapsible fluid container with an elongated shape, towing, and mooring means, as well as container retrieval, storage and deployment means. Reimers, however, does not teach various novel features of the present invention, including, but not limited to, locating means, rapid filling and/or emptying means, and means for preserving the purity and integrity of fluids to be housed within.

Similarly, U.S. Pat. No. 7,500,442 to Schanz, which is hereby incorporated by reference in its entirety, discloses a submerged transport and storage system for liquids and solids. Schanz discloses a towable vessel with optional air and liquid storage bladders useful for adjusting buoyancy and allowing simultaneous transport of different solids and liquids. Schanz further discloses a cord-like connecting spine passing through the hull towing attachment ends to provide longitudinal reinforcement and prevent undesired distortion of the vessel during towing. Schanz, however, fails to teach a device which may be readily transported and/or stored when not in use. Furthermore, Schanz also fails to teach a device with means for locating the towed vessel.

U.S. Pat. Nos. 6,047,655 and 6,330,865 to Cran, which are hereby incorporated by reference in their entireties, disclose a flexible barge. These references disclose system comprising a flexible barge structure with a system of straps to prevent propagation of rips and to distribute concentrated tow forces over the bag. Cran fails to teach several novel aspects of the present invention.

U.S. Pat. No. 2,391,926 to Scott, which is hereby incorporated by reference in its entirety, discloses a non-rigid barge for transporting fluids and other materials by water. Scott also discloses an upper surface or deck of the barge equipped with radio controlled lights or other means for navigational purposes. Scott, however, fails to teach a device comprising means for rapid filling and emptying of fluids and other substances, signaling or other locating means outside of those for

purely navigational purposes, means for filtering and/or preserving the integrity of liquids housed within, and means for storing and transporting the towed vessel when not in use.

Additionally, U.S. Pat. No. 6,293,217 to Savage et al., which is hereby incorporated by reference in its entirety, discloses an apparatus and method for transporting fluid cargo through liquid. Savage et al., discloses an apparatus consisting of one or more units in substantially linear alignment, wherein at least one of the units includes two or more non-internally reinforced containers coupled in a side by side manner. Savage et al., further discloses various close coupled configurations of a plurality of fluid containing units, but fails to teach various novel aspects of the present invention, such as means for signaling, identifying, and/or locating a lost fluid containing unit, means for rapid filling and/or emptying of a device, and means for preserving the integrity of water or other contents contained within the device.

U.S. Pat. No. 5,488,921 to Spragg, which is hereby incorporated by reference in its entirety, discloses a flexible fabric barge apparatus and method for transporting fluent cargos. More specifically, Spragg discloses a series of flexible fabric barges that are connected together in a string for towing and further include a fabric towing cone zipper connected to the lead barge. Spragg, however, fails to disclose various novel features of the present invention.

It is an object of the present invention to provide an at least partially submersible, towed vessel capable of transporting volumes of fluent cargos, such as potable water, juice, wine, and/or various other fluids suitable for human use and consumption.

It is yet another object of the present invention to provide a device suitable for containing large volumes of fluent cargos that is further capable of being towed by various water craft.

It is yet another object of the present invention to provide a towed fluid containing vessel further comprising means to facilitate the rapid filling and emptying of fluids to be contained within. In one embodiment, the present invention comprises a plurality of ports through which a liquid and/or air/gas are conveyed to facilitate the rapid emptying and/or filling of such devices.

It is yet another object of the present invention to provide a water towed vessel further comprising means for signaling a physical position of the vessel. For example, means may be provided to signal to other vessels or individuals the presence and location of the vessel. In one embodiment, lighting means and beacons are disposed on a dorsal portion of a vessel to indicate the presence of the vessel to nearby persons and other vessels. Additional devices, such as nets, buoys, and gated systems, for example, may be deployed around a perimeter of the device to alert various individuals and vessels of the presence of the vessel and/or a vessel's sub-surface presence. U.S. Pat. No. 5,197,912 to Lengefeld discloses a buoy for attachment to the net line of a fishing net and is hereby incorporated by reference in its entirety. Devices disclosed in Lengefeld and those similar may be employed in various features and embodiments of the present invention. For example, a ring or net with marker buoys useful for keeping the ring/net afloat and simultaneously serving as a visual indicator may be employed.

Additionally, means may be provided in association with the vessel to convey information to users or devices at various locations throughout the world regarding the coordinates or relative position of the towed vessel, such as through global positioning systems ("GPS") and other similar devices. Thus, in one embodiment, the present invention comprises light-emitting devices for signaling a position of the device as well as at least one GPS transmitter for broadcasting/transmitting a location of the device.

In an alternative embodiment, devices of the present invention comprise at least one GPS transmission device which is in communication with a network or database that is further accessible by various additional devices. Additional devices of the present invention may include, for example, computer terminals, handheld devices, and a variety of other devices capable of receiving GPS information. Thus, embodiments of the present invention may be tracked by any number of individuals or systems throughout the world. It is yet another object of the present invention to provide means for ease of storage and/or transportation of the towed vessel when not in use for transporting fluent cargos. Such means may include, for example, the ability to fold, roll, or compress the present invention for ease of storage and/or transportation when towing is not desired or needed. In an alternative embodiment, the present invention comprises variable buoyancy control which allows for the adjustment of buoyancy at one or more locations of the device. For example, when a device of the present invention is empty, one longitudinal end of the device may be deprived of buoyancy, while an opposing longitudinal end is allowed to remain buoyant, thus allowing the elongate shape to be positioned in a generally vertical position. In this manner, the device is capable of occupying less area at the surface of a body of water.

In another embodiment, the present invention comprises reinforcing straps secured to at least a portion of the device which are further adapted to accommodate and/or distribute stresses applied to the vessel while being towed. In one embodiment, the reinforcing straps are securely connected with a towing portion of the device and extend radially outward along at least a portion of the vessel's longitudinal length.

It is known that various regions of the Earth which greatly desire and/or require water (for example) are generally devoid of the large-scale infrastructure that is often necessary to quickly extract the contents of a large vessel. Accordingly, embodiments of the present invention include various means for short or long-term off-shore storage. In one embodiment, the present invention is stationed in the proximity of an area in need of water or similar fluids (e.g. a disaster area) in an off-shore location via the use of mooring or substantially immovable objects. Contents of the device are then extracted from the device on an as-needed basis and conveyed to an on-shore location via smaller vessels or temporary conduits (e.g. PVC or similar piping).

In an alternative embodiment, the present invention is capable of selective communication with fixed on-shore infrastructure and devices capable of emptying and subsequently storing the entirety of the volume of a towed vessel. For example, conveying/emptying devices disclosed in U.S. Pat. No. 6,550,410 to Reimers, which is hereby incorporated by reference in its entirety, and those similar may be employed in various embodiments of the present invention.

It is yet another object of the present invention to provide means for filtering fluids to be contained within the device. Such filtering may comprise, for example, filtration upon entrance of the fluid into the vessel, filtration during transport of the fluid, and/or filtration of the fluid upon exit from the vessel. In one embodiment, indigenous (i.e. with respect to the fluids originating source) soils, sands, clays, etc. are provided within or in combination with filters at the entry and exit points of a towed device, thereby forcing water to be conveyed through a natural filter upon entrance and/or exit from a towed device. In one embodiment, disposable filters

are provided which may be discarded and/or have filtration contents replaced after a certain number of filtration passes.

It is yet another aspect of the present invention to provide means for mooring, stabilizing, and/or parking devices of the present invention. For example, U.S. Patent Application Publication No. 2004/0157513 to Dyhrberg, which is hereby incorporated by reference in its entirety, discloses a mooring system for mooring a vessel to a floor portion of a body of water. These and similar devices may be incorporated into various embodiments described herein in order to accommodate, for example, issues related to dock or on-shore storage restrictions, weather and tidal conditions, unpredictable transit times, legal and insurance issues related to positioning a device on-shore or at a dock, and physical restrictions associated with shallow water ports. As used herein, a substantially immovable object refers to mooring devices (despite their general ability to drift or float within a certain radius) as well as more traditional fixed objects such as docks, land, anchored vessels, anchors, etc.

In an alternative embodiment, the present invention comprises the ability to be oriented in a substantially vertical position, either when in a filled or emptied state, due to a portion of the towed vessel being capable of decreasing its buoyancy by the intake of various materials. Such a device comprises a two-way valve which enables the selective control of the buoyancy of one longitudinal end of the vessel and thus provides for ease of storage and protection of the vessel and its contents.

In another embodiment, the invention comprises structures capable of stabilizing towed vessels in a generally vertical arrangement (e.g. for storage). For example, in one embodiment, a first end of a towed vessel is secured to a substantially immobile device and a second end of a towed vessel is secured to means adapted for altering the depth of the second end. In this embodiment, the second end of a substantially empty towed vessel may be selectively transmitted to a submerged position and the towed vessel oriented in a substantially vertical position. Embodiments of the present invention further allow for the vessel to be re-surfaced by, for example, actuating the means adapted for altering the depth of the second end of the vessel. Means adapted for altering depth may be comprised of various known devices comprising at least one linear translation element. For example, worm gears adapted for use in translating associated nuts, pulley systems, hydraulic jack or elevator devices, rail actuators, and various other known devices may be incorporated into embodiments of the present invention. Thus, in one embodiment, the present invention comprises a towed vessel with an elongate shape, a first end adapted for communication with a mooring device that is free to translate within a given radius, and a second end adapted for communication with a linear translation device that selectively adjusts the depth of at least the second end of the vessel.

In one embodiment, water located at greater depths which is known to be of cooler temperature is allowed to cool a volume of fluid or air disposed within a submerged portion of the present invention, thus providing for additional vertical anchoring capabilities. Various selectively controlled valves are useful for further controlling buoyancy. For example, in one embodiment, once a towed vessel is oriented in a generally vertical position, colder/denser water proximal to a submerged location is drawn into at least a portion of the vessel, facilitating vertical storage of the device. User operated valves are further capable of being activated in order to dispel said colder/denser water when the vessel is to be repositioned generally parallel with a surface.

Those of skill in the art will recognize that oceanic thermoclines and haloclines may be taken advantage for the storage, convection, etc. of various embodiments of the present invention. In one embodiment, water or fluid disposed in a submerged portion of the vessel may be heated, thus inducing convection currents within a towed device and preserving integrity of the water. Density of water, which is defined as Mass/Volume (g/cm^3) may be accounted for, adjusted, and otherwise modified in various embodiments of the present invention. It is further known that seawater is denser than freshwater, thus facilitating the transport of a contained volume of freshwater through a denser body of salt water.

It is yet another aspect of the present invention to provide a towed device which is capable of being transported in series with additional towed devices or consists. Thus, in one embodiment, a towed device comprises the ability to be placed in secure communication with one or more additional towed devices, thereby providing the ability to increase the total volume of a fluid to be transported. In one embodiment, the present invention comprises tracking abilities, such as those described in European Patent No. EP 1,723,021 to Hendrickson et al. which discloses a Rail Car Tracking System and is hereby incorporated by reference in its entirety. Although Hendrickson et al. relates generally to the field of rail transportation, those of skill in the art will recognize that various embodiments as described therein may be applicable to and useful for tracking water-towed vessels of the present invention, whether towed in consists/trains, or towed individually. Tag readers for use in the present invention may be disposed on, for example, docks, buoys, vessels, aircraft, etc. and may be capable of reading information from water-towed vessels related to physical position, contents, temperature (internal or external to the towed vessel, velocity, and other pertinent information).

These and other needs are addressed by the various embodiments and configurations of the present invention. These and other advantages will be apparent from the disclosure of the invention(s) contained herein. The above-described embodiments, objectives, and configurations are neither complete nor exhaustive. As will be appreciated, other embodiments of the invention are possible using, alone or in combination, one or more of the features set forth above or described in detail below.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a top plan view of a towed vessel suitable for transporting liquids according to one embodiment.

FIG. **2** is a side elevation view of a towed vessel suitable for transporting liquids.

FIG. **3** is a diagram depicting various features of a towed vessel suitable for transporting liquids according to one embodiment.

FIG. **4** is a cross-sectional side elevation view of a towed vessel suitable for transporting liquids according to one embodiment.

FIG. **5** is a cross-sectional perspective view of a towed vessel suitable for transporting liquids according to one embodiment.

FIG. **6** is a side elevation view of a towed vessel suitable for transporting liquids according to one embodiment.

FIG. **7** is a side elevation view of the present invention according to one embodiment.

FIG. **8** is a side elevation view of the present invention according to one embodiment.

DETAILED DESCRIPTION OF DRAWINGS

FIG. **1** depicts a towable vessel **10** for transporting fluent cargoes. In one embodiment of the present invention, a tow-

able vessel **10** may comprise a plurality of ports **14** suitable for the inlet and removal of fluids to be transported. One of skill in the art will recognize that a plurality of such ports may be useful in fluid removal operations, both as a means to increase the flow rate of fluid into a vessel **10** and/or to allow for air intake into one port **14** while fluid is extracted from another port **14**. In some operations, it may be desirable to transport extremely large volumes of fluid. For example, it may be desirable to transport in excess of 35,000 tons of water in a single vessel **10**. Accordingly, increased flow rates to and from a vessel may be desirable and stand to increase the overall efficiency of the system and fluid transport operations.

Vessels **10** of the present invention may be comprised of a variety of non-rigid, flexible materials including, but not limited to, urethane, polyurethane, urethane-coated polyesters, thermoplastic urethane coated nylon, vinyl, and other similar materials or various combinations of the same. Those of skill in the art will recognize the various advantages of constructing a vessel **10** of the present invention out of a flexible material, including, but not limited to, the ability to easily store and transport the vessel **10** when it is not in use for transporting liquids.

In one embodiment, a towable vessel **10** further comprises a reinforcing member **18** on at least one node or end of the vessel for attachment to towing members and vessels. Reinforcing members **18** may be comprised of rigid structures fastened to or otherwise connected to a pliable or flexible container **22** and capable of withstanding various tension forces imparted to the vessel **10** during towing. Reinforcing members **18** may further be connected to reinforcing seams **26** which travel through a longitudinal length of a towable vessel **10**. Reinforcing seams **26** may be comprised of a variety of known materials, including, but not limited to metal cables, nylon cords, plastics, and various other materials suitable for withstanding tensile loading. Reinforcing seams **26** may transmit and resist forces applied to a towed portion of the vessel **10**, thereby reducing unwanted deflection of the vessel **10** and associated drag on the vessel **10**.

In an alternative embodiment, a towed vessel **10** comprises an ellipsoid shaped hull (when in a filled state) to reduce drag, at least one air chamber to maintain the vessel in an upright position, one or more ports **14** for filling and/or emptying the vessel, one or more removable bladders capable of containing and segregating different liquids or materials, and one or more devices capable of selectively controlling the amount of air within a portion of the device **10** and corresponding buoyancy.

It will be recognized that the shape of the vessel **10** may take various different forms, depending upon the desired quantity of fluid to be transported, characteristics of the vessel(s) towing the vessel **10**, and other factors. However, it will further be recognized that it is desirable to reduce drag in water towing applications. Accordingly, it is known that drag on the vessel **10** will decrease as the wetted surface area and width of the vessel **10** decrease, and while length increases. Therefore, in order to improve towing efficiency, an optimal geometric design may be constructed.

FIG. **2** depicts a side elevation view of one embodiment of the present invention with respect to a water line **30**. In water towed operations, it may be desirable to adjust the buoyancy of the object, either due to various environmental conditions or based on the amount of water contained within the vessel **10**. Accordingly, the present invention contemplates operating a vessel **10** at various depths within a body of water. Variable buoyancy may be obtained, for example, through the use of a dorsal bladder (not shown) which contains air or a gas of lower density than a material to be towed, which both maintains the vessel **10** in an upright position and provides a certain amount of buoyancy relative to the vessel's surroundings. Alternatively, air or gas may be housed within a main portion of the device **10** to provide similar functionality.

In one embodiment, ports **14** include the ability to exhaust and intake air based on a desired level of buoyancy. For example, one or more ports **14** are equipped with means, such as reversible impellers to draw air in or exhaust air from a previously disclosed bladder or from one or more fluid containing compartments of the invention **10**.

Buoyancy may be adjusted, for example, when various environmental conditions change. In long-distance open sea transit, it is known that temperature changes may occur in the surrounding waters. Accordingly, a fluid containing vessel **10** that has been towed in relatively cold waters for a length of time may obtain an increased density due to cooling effects from the surrounding water. When such a cooled vessel **10** reaches warmer waters, and particularly when there is an abrupt transition, the cooled vessel **10** may have a tendency to sink or reside lower in its surrounding water. To account for this, embodiments of the present invention comprise means for taking in additional air and increasing buoyancy. For example, ports **14** comprise manually activated or logic driven motors to adjust buoyancy while the device is in operation. A manually activated motor may be controlled from within a towing vessel or from another remote location and may allow a user to increase the volume of air contained within a vessel **10** based on the visual appearance of the vessel **10** or other indicia. Logic driven motors may be comprised of devices which sense one of: a difference between the temperate of water within the vessel **10** and the vessel **10** itself, a sudden change in the temperature of the water within which the device is being towed, or the amount of submersion of the vessel **10** within its surroundings. For example, a sensor may be employed at a certain location of the vessel **10** which senses the presence of an unacceptably high level of submersion and triggers motor(s) within one or more ports **14** to intake air and thereby increase the buoyancy of the vessel **10**.

It will be recognized that it is often desirable to prevent materials, such as rain, sea water, and other contaminants from entering the ports **14** and thus impacting the purity of water or fluids to be transported. Accordingly, the present invention contemplates means to secure the ports **14** when venting or adding fluid or gas is not desired. For example, covers suitable for preventing the unwanted entrance of materials may be selectively actuated, such as by a remote user. Alternatively, ports **14** for venting air may be connected solely to a bladder which is not interconnected to a main fluid containing portion of the device **10**. In one embodiment, physical barriers may be constructed around ports **14** which allow for the entrance and exhaust of gas, but prevent the unwanted entrance of various fluids.

In one embodiment, one or more one-way valves may be constructed on a portion of the vessel **10** that is to reside above the water line. One-way valves are known to those of skill in the art and may be provided to allow for the venting of gases, yet still prevent the unwanted entrance of other fluids or contaminants. For example, one one-way valve may be employed to allow for the release of air when less buoyancy is desired and another may be provided to allow for the opposite flow of air into a device **10** when greater buoyancy is desired. In one embodiment, one or more of these valves are selectively controlled by a user. In this manner, a user may have discretion as to when to insert air (i.e. a user may elect to insert air during optimal conditions when the risk of taking sea or rainwater is low) and/or remove air.

As shown, one or more fins or skegs **34** may be included on a vessel at a location below the water line **30** to increase directional stability of the vessel **10** while being towed. In one embodiment, one or more skegs **34** may be selectively controlled to assist in steering and/or maneuvering the potentially cumbersome vessel.

In one embodiment, the present invention comprises locating means. As will be recognized, submerged or partially submerged vessels may be difficult to identify, particularly in poor lighting conditions or at night. Additionally, it is a known risk that vessels **10** of the present invention and similar objects may become dislodged from their towing vessel. In such circumstances, these vessels may pose significant safety risks. While it is an aspect of the present invention that damage to or loss of devices of the present invention pose reduced risk to the environment, vessels separated from their host or towing vessel may still pose a collision risk. Accordingly, a transmitting device, such as a Global Positioning System ("GPS") transmitter is incorporated into one embodiment of the present invention. The GPS transmitter may, for example, transmit the coordinates of a vessel **10** at specified temporal increments or when another related device requests such information. Additionally, other vessels or remote locations may be equipped with GPS sensing means to detect and convey the transmitted location of a vessel **10**.

FIG. **3** depicts a towed vessel for fluent cargo transport **10** equipped with a GPS transponder **38**. In one embodiment, the GPS transponder **38** may be activated remotely, such as when a towing vessel recognizes that it has lost contact with the towed vessel **10**. In another embodiment, the towed vessel **10** may constantly transmit information regarding its own coordinates. For example, the vessel **10** may transmit information regarding its location at predetermined time intervals whether or not it is detached from a towing vessel. In yet another embodiment, a vessel **10** may transmit information regarding its location upon request (i.e. at the receipt of a signal from another location or device). Information regarding a vessel's **10** position may be transmitted to and received by various different locations and objects. For example, the signal and information transmitted by a GPS transmitter **38** may be obtained by a remote computing station **42** for processing and displaying the information. A remote computing station **42** may reside in a variety of locations, including on other vessels and various fixed on-shore locations. Information transmitted by a GPS transmitter **38** may also be received by various other vessels **46** potentially in the vicinity of the towed (or misplaced) vessel **10**. Vessels **46** may be equipped with indicator means **50** capable of alerting crew members that a partially submerged object **10** is present in their vicinity and may pose a safety risk.

Various other advantages of equipping a vessel **10** with GPS locating means will be recognized by those of skill in the art. For example, the status and progress of a fluid containing vessel **10** may be tracked remotely by interested parties to determine logistical information.

A vessel **10** may comprise visual indicia of its location and size, such as conventional lighting members positioned at various locations on the vessel **10**. Additionally, given the significant width that floating vessels of the present invention may comprise, it is further contemplated that a vessel **10** may be equipped with port and starboard indicator lights to indicate the lateral boundaries of a vessel **10** (i.e. conventionally, green lights are used to indicate the starboard side and red lights to indicate the port side).

One of skill in the art will recognize that it may be desirable to transport a vessel **10** of the present invention in an emptied state, such as when a vessel **10** has been transported from a source to a delivery site and must thereafter be returned. In these circumstances, it is desirable to transport the vessel **10** in a manner requiring the least amount of storage space, weight and fuel costs. Accordingly, one embodiment of the present invention comprises the ability to at least partially deflate or extract a volume of air from a vessel **10** either during emptying operations or subsequent thereto. For example, vacuum powered means for emptying a vessel **10** may be attached to ports **14** to enable the extraction of an internal volume of fluid. Once all or most of an internal volume of fluid has been removed, the same or similar vacuum powered devices may be utilized to further extract a remaining internal volume of air from the vessel **10**. It will be recognized that in such operations, measures may need to be taken to prevent a fully deflated vessel from sinking Accordingly, the device **10** may be tethered to various objects, such as a towing vessel or fixed on-shore objects via attachment means **18** or other similar structures on the device **10**. Deflating a vessel **10** as described offers the benefits of reducing the overall weight and volume of a device **10** to be transported, as well as reducing the potential for mold and other contaminants to grow inside of an otherwise damp and dark internal volume.

Once deflated, a vessel **10** may be further compacted by folding or rolling the vessel **10** onto a storage drum or wheel. Devices for rolling a large vessel **10** onto a storage drum are described in, for example, U.S. Pat. No. 6,550,410 to Reimers, which is hereby incorporated by reference in its entirety.

As an alternative to deflation, it is contemplated that vessels of the present invention may be alternatively filled with an air or gas of a sufficiently lower density than water to provide adequate buoyancy. In this manner, vessels **10** may then be towed in an "empty" state with minimal drag and associated fuel consumption needed to return a vessel **10** to another location for further filling or recycling. For example, helium and/or ambient air may be inserted into an emptied vessel **10** to provide sufficient buoyancy and minimal drag upon the vessel when towed without fluent cargo.

Embodiments of the present invention may take the form or appearance of various objects which, for example, may hold commercial appeal or value. For example, at least a portion (e.g. a non-submerged portion) of towed vessels **10** of the present invention may comprise specific shapes or form specific characters for the purpose of displaying an image or a message. Images contemplated by the present invention include, but are not limited to, those with commercial appeal, such as trademarked or otherwise recognizable images or slogans which can be viewed by individuals including cruise passengers, airline passengers, and extraterrestrial image sensors (e.g. satellite photography).

It is further contemplated to provide vessels **10** of the present invention with the ability to selectively or temporarily display various images or messages. For example, portions of a vessel **10** which are inflated may be selectively inflated or positioned to display various images or text. In this manner, customizable messages may be displayed to various viewers. Alternatively, a portion of a vessel **10** of the present invention may include the ability to display written or marked images. For example, various inks, dyes, and similar materials may be placed upon a visible portion of the present invention. Such materials may be used to display, for example, the name of a company transporting contents, a third-party advertiser, or personal messages (e.g. a marriage proposal).

In one embodiment, the present invention contemplates preserving the integrity and purity of fluids to be contained within a vessel **10** by incorporating various features and mate-

rials of the fluids original natural surroundings. For example, embodiments of the present invention may be utilized in transporting water from remote and pristine regions of the Earth. In such applications, various natural features of these regions, such as natural soils and clays, may be incorporated into in the towed vessel **10**. U.S. Provisional Patent Application 61251912 to Szydlowski, which is hereby incorporated by reference in its entirety, discloses various benefits of naturally occurring soils when used for water filtration purposes.

In applications where water to be transported is desired for its natural characteristics, including purity, mineral content, and other attributes, it is often desirable to maintain those characteristics throughout filling, transporting, and emptying a vessel **10**. Accordingly, the present invention contemplates various means to preserve purity of a transported fluid, particularly when polyurethane, polyethylene, and other materials are employed as the structure of a vessel **10**. As shown in FIG. **4**, natural sediment **54** may be deposited within a towed vessel **10** which may act to isolate vessel contents from an inner surface of the vessel **10** as well as provide for filtration of the vessel contents upon entrance or exit from the vessel **10**. Natural sediment **54** may be comprised of a variety of known soils, preferably those indigenous to the source of the water or fluid to be transported. For example, native clay minerals may be disposed within a vessel **10** to serve this function. Those of skill in the art will recognize the benefits offered by clay, including, but not limited to, its ability to isolate fluids from a vessel's inner surface and its effectiveness in filtration.

In addition to acting as an isolating barrier between fluid to be transported and at least a portion of vessel's inner surface, the sediment **54** may also be useful in filtering fluids contained within the vessel **10**. For example, where emptying of the vessel **10** is accomplish by connecting vacuum powered means to ports **14**, sediment **54** may be allowed to be drawn toward the ports **14**. In one embodiment, this may be accomplished through the use of one or more flexible tubes or conduits **58**. Upon reaching the ports **14**, the sediment may be allowed to be trapped by any number of known filter devices. Such filter devices may include, for example, various mesh screens which may trap sediment particles and create a sedimentary filtration mechanism at an outlet **14** of the vessel **10**.

In addition to or in lieu of depositing a layer of sediment within a vessel **10**, the interior surface area of a vessel **10** may be coated with a substance known to preserve the integrity and purity of fluid to be transported. Various coating methods and substances are known and described in, for example, U.S. Pat. No. 6,808,808 to Freeman et al., which is hereby incorporated by reference in its entirety.

In various embodiments of the present invention, coatings are utilized on a bottom portion of a vessel **10**. For example, where vessels are required to be towed into shallow water ports, a risk of puncture or tear to the bottom of the device **10** may be present. Accordingly, an abrasion and tear resistant material comprises at least a lower portion of the vessel **10**. For example, various different Teflon fabrics may comprise or be added to a bottom portion of a vessel **10** to avoid unwanted tearing.

FIG. **5** is a cross-sectional perspective view depicting one embodiment where a towed vessel **10** is comprised of various different internal compartments. Embodiments of the present invention may include, for example, a bladder **62** which may be used to provide buoyancy for the vessel **10** as well as assist in maintaining the vessel **10** in a substantially upright position. In addition to a bladder **62**, embodiments of the present invention may further comprise various compartments **66** within a larger vessel body **22**. Various sizes and shapes of additional compartments **66** may be useful, for example, where a variety of different fluids are to be transported and comingling of these fluids is undesirable. Embodiments of the present invention comprising multiple internal compartments **66** allow for the simultaneous transport of, for example, fresh water, juice, wine, and a variety of other fluids. To allow access to various different compartments **66**, embodiments of the present invention provide for a variety of ports **14** which allow for exclusive access to specific compartments **66**. Ports **14** may be connected to compartments **66** through previously described flexible tubes or conduits. Embodiments of the present invention further contemplate marking systems to identify which ports **14** are associated with compartments **66**. For example, where cross-contamination of ports **14**, associated tubes or conduits **58**, and compartments **66** is undesired (i.e. where one or more port **14**, conduit **58**, and compartment **66** should be used only for a single type of fluent cargo), marking means such as text and color indicators are provided on a portion of the port **14** or vessel structure **22** to indicate to a user which materials should or should not be associated with a port **14**. Those of skill in the art will recognize that the present invention is not limited to any number, sizes, or types of internal compartments **66**. Indeed, the present invention contemplates the use of a single internal volume within a towed vessel as well as numerous compartments **66**.

In one embodiment of the present invention, a towed vessel further comprises mooring devices or means for attaching to mooring devices. For example, a towed vessel **10** includes fasteners, rigid members, and/or connecting devices to allow for a towed vessel **10** to be moored. Devices, and rigid members which may be connected to various portions of a mooring device include those disclosed in U.S. Pat. No. Application Publication No. 2004/0157513 to Dyhrberg and U.S. Pat. No. 4,627,375 to Davis et al., which are hereby incorporated by reference in their entireties, and other similar known mooring devices. Including mooring devices as part of a towed vessel **10** or, alternatively, providing means to attach a towed vessel **10** to various mooring devices allows for the ability to fill or empty devices of the present invention in a number of locations or orientations, store the device **10** in a docked or offshore location, and generally stabilize the structure **10** when transport is not desired.

Referring now to FIG. **6**, one embodiment of the present invention is shown for storing a towed vessel **10** in a marine environment in a substantially vertical position with respect to a water line **30**. In one embodiment, the present invention is capable of carrying up to 1,000,000 m^3 of bulk water. Accordingly, those of skill in the art will recognize that such an object, particularly when oriented in a generally horizontal position, will occupy a significant surface area. Therefore, one embodiment of the present invention contemplates devices and methods for storing a towed vessel **10** in a generally vertical position with respect to a water line **30**. A first portion **70** of a towed device is inflated or similarly experiences an increase in buoyancy while an additional portion **74**, preferably disposed at the distal longitudinal end, is filled with water or similarly experiences a decrease in buoyancy/density. In this manner, the device **10** may be allowed to float on-end and occupy substantially less volume than it would if docked or allowed to remain horizontal. In one embodiment, the contents and associated buoyancy of compartments **70**, **74** are varied and/or controlled by one or more one-way or two-way valves **14**. For example, compartment **74** may be filled with water via the control of valve **14**. The volume of water taken in by valve **14** is then allowed to cool due to its position in a deeper portion of a body of water which is known to generally be colder than areas disposed closer to the surface

30. In one embodiment, valve 14 comprises a two-way valve capable of dispelling water from a compartment 74 and facilitating the repositioning of the device 10 to a surfaced position.

In an alternative embodiment, a towed vessel 10 may be stored in a generally vertical position either when it is an emptied or full state. Such a device is capable of being attached to various fixed and/or floating objects (e.g. mooring devices) via reinforcing member 18, while a distal end of the device 10 is allowed to sink. In one embodiment, the distal end is allowed to sink by decreasing the buoyancy of a portion 74 of the vessel through the addition of water, sand, ballast, etc., which is further capable of being expelled from the device via two-way valve 14 in order to restore the vessel 10 to a generally horizontal position.

Referring now to FIGS. 7-8, a towed vessel 10 and associated storage means are depicted. When a vessel 10 is to be stored, a reinforcing member 18 may be attached to a securing device, such as a mooring buoy 94 and associated anchor line/chain 98 which may be securely fixed to a floor 102 of a marine environment. Additionally, a second end may be secured to a translatable device 78 positioned on a fixed member 82. Thus, in one embodiment, the vessel 10 resides at the surface 30 of a body of water in a substantially immobile position when the translatable device 78 is located at or near a surface position 86. Towed vessels 10 of the present invention may be selectively positioned in a substantially vertical position by translating the translatable device 78 along a vertical length of the fixed member 82 so that the translatable device 78 and second end of the vessel 10 is disposed in a submerged position 90. One of skill in the art will recognize that mooring devices 94, 98 of the present invention, although generally fixed, may be free to translate within a given radius. Thus, when one end of a vessel 10 is submerged, an end attached to a mooring buoy 94 may reposition itself to a location proximal to the fixed member 82, thus allowing the vessel 10 to reside in a substantially vertical position for storage. The vertical positioning of vessels 10 of the present invention may be facilitated by the inclusion of a portion 70 of the vessel 10 which retains a sufficient amount of buoyancy so as to prevent the entire vessel 10 from sinking Alternatively, mooring buoys 94 of the present invention may comprise sufficient buoyancy to support a load applied by a partially submerged vessel 10.

Vertical positioning devices 82 of the present invention may comprise various known devices useful in the linear translation of objects. For example, worm gears adapted for use in translating associated nuts, pulley systems, hydraulic jack or elevator devices, rail actuators, and various other known devices useful for translating a device 78 between a raised 86 and lowered 90 position may be incorporated into embodiments of the present invention.

It will be recognized that various different liquids and gases may be contained and transported within embodiments of the present invention. Accordingly the present invention is not limited to the transport of water, wine, or human potable substances.

While various embodiments of the present invention have been described in detail, it is apparent that modifications and alterations of those embodiments will occur to those skilled in the art. However, it is to be expressly understood that such modifications and alterations are within the scope and spirit of the present invention, as set forth in the Summary, Detailed Description, and in the following claims. Further, the invention(s) described herein are capable of other embodiments and of being practiced or of being carried out in various ways. In addition, it is to be understood that the phraseology and terminology used herein is for the purposes of description and should not be regarded as limiting. The use of "including," "comprising," or "adding" and variations thereof herein are meant to encompass the items listed thereafter and equivalents thereof, as well as, additional items.

What is claimed is:

1. A method for storing and conveying fluids, said method comprising:

(a) providing:

a non-rigid, water-impermeable device with an elongate shape having a first end, a second end and having a generally planar and streamlined shape in plan view;

the first end comprising a first attachment device;

the second end comprising a second attachment device;

a plurality of ports for intake and exhaust of fluids;

at least one of the plurality of ports comprising a valve for the user to adjust buoyancy of the device;

at least a portion of the device containing a fluid of lower density than a fluid through which said device is transported;

one or more valves in two-way communication with at least a portion of an interior volume of the device and an outside environment;

a transmitter for conveying information related to a geographic position of the device;

at least a portion of an internal surface area of the device being comprised of a flexible and tear resistant material;

a mooring device;

an anchored member having a first end, a second end, and a longitudinal length; and

a translatable device disposed on the longitudinal length of the anchored member;

(b) securing the first attachment device of the first end to the mooring device;

(c) securing the second attachment device of the second end to the translatable device disposed on the longitudinal length of the anchored member;

(d) lowering the translatable device to a submerged position;

(e) positioning the non-rigid, water-impermeable device in a substantially vertical position;

(f) filtering said fluid of lower density prior to emptying the device; and

(g) rapidly emptying the device of fluids through at least one of said plurality of ports.

2. The method as set forth in claim 1, further comprising signaling the geographic position of said device.

3. The method as set forth in claim 1, wherein the positioning of the device in the substantially vertical position is achieved via the employment of a bladder.

4. The method as set forth in claim 1, further comprising, storing an entirety of the fluid of lower density in said non-rigid, water-impermeable device.

5. The method as set forth in claim 1, further comprising, stabilizing the non-rigid, water-impermeable device by mooring the non-rigid, water-impermeable device to a fixed or floating object.

6. The method as set forth in claim 1, further comprising, heating the fluid disposed in said non-rigid, water-impermeable device to induce a convection current.

7. The method as set forth in claim 1, further comprising tracking said non-rigid, water-impermeable device after said device is positioned in the substantially vertical position.

8. The method as set forth in claim 1, further comprising, segregating different liquids within said device.

9. The method as set forth in claim 1, further comprising, controlling the amount of air within a portion of the device to adjust buoyancy of the device.

10. The method as set forth in claim 1, further comprising, venting the device in a manner that prevents entrance of contaminants into the device.

11. A method for storing and conveying fluids, said method comprising:

(a) providing:

a non-rigid, water-impermeable device with an elongate shape having a first end and a second end and having a generally planar and streamlined shape in plan view;

the first end comprising a first attachment device;

the second end comprising a second attachment device;

a plurality of ports for intake and exhaust of fluids;

at least one of the plurality of ports comprising a valve for a user to adjust buoyancy of the device;

at least a portion of the device containing a fluid of lower density than a fluid through which said device is transported;

one or more valves in two-way communication with at least a portion of an interior volume of the device and an outside environment;

a transmitter for conveying information related to a geographic position of the device;

at least a portion of an internal surface area of the device being comprised of a flexible and tear resistant material;

a mooring device;

an anchored member having a first end, a second end, and a longitudinal length; and

a translatable device disposed on the longitudinal length of the anchored member;

(b) securing the first attachment device of the first end to the mooring device;

(c) securing the second attachment device of the second end to the translatable device disposed on the longitudinal length of the anchored member;

(d) lowering the translatable device to a submerged position;

(e) signaling the geographic position of said device; and

(f) tracking the device using a device that receives GPS information.

12. The method as set forth in claim 11, further comprising, rapidly emptying the device of fluids through at least one of said plurality of ports.

13. The method as set forth in claim 11, further comprising, steering the device via one or more skegs positioned on said device.

14. The method as set forth in claim 11, further comprising, transmitting coordinates of the device at predetermined temporal increments.

15. The method as set forth in claim 11, further comprising, deflating the non-rigid, water-impermeable device to reduce a volume of the device for ease of transport.

16. The method as set forth in claim 11, further comprising, preserving the integrity of the fluid contained within the device when the device is in the submerged position.

17. The method as set forth in claim 11, further comprising, coating the internal surface of the device to preserve the purity of said lower density fluid.

18. The method as set forth in claim 11, further comprising, heating the fluid disposed in said non-rigid, water-impermeable device to induce a convection current.

19. The method as set forth in claim 11, further comprising, identifying the plurality of ports for the intake and exhaust of fluids via a marking system that identifies which of the plurality of ports for the intake and exhaust of fluids are associated with compartments that are connected to at least one of said ports.

20. The method as set forth in claim 11, further comprising:

positioning the non-rigid, water-impermeable device in a generally vertical position with respect to a water line and storing the device in the generally vertical position.

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